CALIBRATION STANDARD REQUIREMENT

FOR A

PROGRAMMABLE AUDIO ANALYZER

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PROCUREMENT PACKAGE

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1. SCOPE

1.1 Scope. This requirement defines the mechanical, electrical, and electronic characteristics for a Programmable Audio Analyzer. This equipment is intended to be used by Navy personnel in shipboard and shore based laboratories to measure distortion, signal-to-noise ratio, SINAD ratio, frequency, and AC and DC voltage levels of signal with a frequency range from 20 Hz to 100 kHz. For the purposes of this requirement, the Programmable Audio Analyzer shall be referred to as the ANALYZER.

2. APPLICABLE DOCUMENTS

2.1 Controlling Specifications. MIL-T-28800, "Military Specification, Test Equipment for use with Electrical and Electronic Equipment, General Specification for," and all documents referenced therein of the issues in effect on the date of the solicitation shall form a part of this requirement.

3. REQUIREMENTS

3.1 General. The ANALYZER shall conform to Type II, Class 5, Style E requirements as specified in MIL-T-28800 for Navy shipboard and shorebased use as modified below. The use of material restricted for Navy use shall be governed by MIL-T-28800.

3.1.1 Design and Construction. The ANALYZER design and construction shall meet the requirements of MIL-T-28800 for Type II equipment.

3.1.2 Power Requirements. The ANALYZER shall operate from a source of 103.5 V to 126.5 V at 50 Hz and 60 Hz ± 5% single-phase input power as specified in MIL-T-28800.

3.1.2.1 Fuses or Circuit Breakers. Fuses or circuit breakers shall be provided. If circuit breakers are used, both sides of the power source shall be automatically disconnected from the equipment in the event of excessive current. If fuses are used, only the line side of the input power line as defined by MIL-C-28777, shall be fused. Fuses or circuit breakers shall be readily accessible.

3.1.2.2 Power Connection. The requirements for power source connections shall be in accordance with MIL-T-28800 with a 6-foot minimum length cord.

3.1.3 Dimensions and Weight. Maximum dimensions shall not exceed 19 inches in width, 7 inches in height, and 20 inches in depth. The weight shall not exceed 35 pounds.

3.1.4 Lithium Batteries. Per MIL-T-28800, lithium batteries are prohibited without prior authorization. A request for approval for the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.

3.2 Environmental Requirements. The ANALYZER shall meet the environmental requirements for Type II, Class 5, Style E equipment with the deviations specified below.

3.2.1 Temperature and Humidity. The ANALYZER shall meet the conditions below:

	Temperature (°C)	Relative humidity (%)
Operating	10 to 30	95
	30 to 40	75
Non-operating	-40 to 70	Not Controlled

3.2.2 Electromagnetic Compatibility. The electromagnetic compatibility requirements of MIL-T-28800 are limited to the following areas: CE01, CE03, CS01, CS02, CS06, RE01, RE02 (14 kHz to 1 GHz), and RS03.

3.3 Reliability. Type II reliability requirements are as specified in MIL-T-28800.

3.3.1 Calibration Interval. The ANALYZER shall have an 85% or greater probability of remaining within tolerances on all specifications at the end of a 12 month period.

3.4 Maintainability. The ANALYZER shall meet the Type II maintainability requirements as specified in MIL-T-28800 except the lowest discrete component shall be defined as a replaceable assembly. Certification time shall not exceed 60 minutes.

3.5 Performance Requirements. The ANALYZER shall provide the following capability as specified below. Unless otherwise indicated, all specifications shall be met following a 30 minute warm-up period.

3.5.1 Frequency Range. The ANALYZER shall provide frequencies from at least 20 Hz to 100 kHz.

3.5.1.1 Frequency Uncertainty. The ANALYZER frequency output uncertainty shall be equal to or better than 0.3% of setting throughout all ranges.

3.5.1.2 Output Level. The ANALYZER shall have a continuously variable output with a minimum output level of 0.6 mV to 6 V into an open circuit.

3.5.1.3 Output Impedance. The ANALYZER shall have a selectable 600 ohm or 50 ohm output impedance.

3.5.1.4 Frequency Response. At 1 kHz frequency reference, the ANALYZER output level shall be flat within specifications defined in the table below:

Range	Flatness
20 Hz to 20 kHz	± 0.06 dB
20 Hz to 100 kHz	± 0.22 dB

3.5.1.5 Distortion and Noise. The distortion and noise of waveform signal as generated by the ANALYZER shall not exceed the values provided in the following table:

	Range	Distortion and Noise
80 kHz BW:	20 Hz to 20 kHz	-80 dB (0.01%) or 15 (V
500 kHz BW:	20 Hz to 50 kHz	-70 dB (0.032%) or 38 (V
500 kHz BW:	50 kHz to 100 kHz	-65 dB (0.056%) or 38 (V

3.5.2 Input Level. The ANALYZER shall have voltage input ranges of at least 0.3 mV to 300 V full scale for AC, and at least 4.0 V to 300 V full scale for DC.

3.5.2.1 Voltage Display Uncertainty. The ANALYZER voltage display uncertainty shall be as follows:

Level	Frequency	Uncertainty
50 mV to 300 V	20 Hz to 20 kHz	2%
0.3 mV to 50 mV	20 Hz to 100 kHz	4%
50 mV to 300 V	20 kHz to 100 kHz	4%
0.6 V to 300 V	d.c	1%

3.5.2.2 Maximum Input. The ANALYZER shall withstand an input voltage of 425 Vp applied differentially or between input to ground.

3.5.2.3 Input Impedance. The input impedance of the ANALYZER shall be 100 kohm or greater shunted by less than 300 pf.

3.5.2.4 Common Mode Rejection Ratio (CMRR). The CMRR of ANALYZER input shall be greater than the following:

Frequency	CMRR
20 Hz to 1 kHz	45 dB
1 kHz to 20 kHz	30 dB

3.5.3 Distortion Measurement Range. The ANALYZER shall be capable of measuring distortions from 0.001% to 100% (-99.99 to

0 dB) from a minimum input voltage limited by the residual distortion and noise specified in paragraph 3.5.3.2 to a maximum of 300 V.

3.5.3.1 Harmonic Measurement Uncertainty. The ANALYZER total harmonic distortion measurement uncertainty shall not exceed the following:

Range	Uncertainty
20 Hz to 20 kHz	±1 dB
20 kHz to 100 kHz	±2 dB

3.5.3.2 Residual Distortion and Noise. The residual distortion and noise of ANALYZER shall not exceed the values provided in the following table:

	Range	Distortion and Noise
80 kHz BW:	20 Hz to 20 kHz	-80 dB (0.01%) or 15 (V
500 kHz BW:	20 Hz to 50 kHz	-70 dB (0.032%) or 45 (V
500 kHz BW:	50 kHz to 100 kHz	-65 dB (0.056%) or 45 (V

3.5.4 Frequency Measurement Range. The ANALYZER shall be capable of measuring frequencies from at least 20 Hz to 100 kHz.

3.5.4.1 Frequency Measurement uncertainty. The ANALYZER frequency measurement shall have an uncertainty within 0.004% plus one digit with five digit display resolution.

3.5.4.2 Frequency Measurement Sensitivity. The ANALYZER frequency measurement sensitivity shall be less than or equal to 50 mV in distortion and SINAD modes, and less than or equal to 5 mV in AC and signal-to-noise modes.

3.5.5 SINAD Measurement Range. The ANALYZER shall be capable of measuring SINAD ratios ranged from 0 to 99.99 dB from a minimum input voltage limited by the residual distortion and noise specified in paragraph 3.5.3.2 to a maximum of 300 V.

3.5.5.1 SINAD Ratio Measurement Uncertainty. The ANALYZER SINAD ratio measurement uncertainty shall be within ±1 dB for 20 Hz to 20 kHz frequency range, and ±2 dB for 20 kHz to 100 kHz frequency range.

3.5.6 Signal-to-Noise Ratio Measurement Range. The ANALYZER shall be capable of measuring signal-to-noise ratios ranged from 0 to 99.99 dB from a minimum input voltage limited by the residual noise specified in paragraph 3.5.6.2 to a maximum of 300 V.

3.5.6.1 Signal-to-Noise Measurement Uncertainty. The ANALYZER signal-to-noise ratio measurement uncertainty shall be equal to or better than 1 dB.

3.5.6.2 Residual Noise. The residual noise of the analyzer shall not exceed the higher of -85 dB or 17 (V for 80 kHz bandwidth or -70 dB or 50 (V for 500 kHz bandwidth.

3.5.7 Input Filters. The ANALYZER shall be provided with 30 kHz and 80 kHz low pass filters with 60 dB per decade roll off and 400 Hz high pass filter with 140 dB per decade roll off. The ANALYZER shall have provisions for adding other filters.

3.6 Operating Requirements. The ANALYZER shall provide the following operating capabilities.

3.6.1 Front Panel Control Requirements. All modes and functions shall be operable using front panel controls. The locations and labeling of indicators, controls, and switches shall provide for maximum clarity and easily understood operation without reference to tables, charts, or flow diagrams.

3.6.2 Programmability. All modes and functions shall be fully remotely programmable via the IEEE-488.1 instrumentation bus. When operating the ANALYZER via remote programming, all front panel controls shall be disabled, except for the on / off switch and the Remote / Local switch.

3.6.3 Error Correction. During calibration, the ANALYZER shall provide the capability to accept and store corrections for all measurement deviations from nominal conditions. This correction capability shall be operational from the front panel control and over the IEEE-488 bus. The ANALYZER shall be capable of changing any calibration factor or other correction data stored in memory of the ANALYZER without removal of any memory circuits or devices. The calibration constants may be changed only if a switch (not a key switch) on the rear panel is enabled. When the ANALYZER is operated within its calibration period, it shall meet all the specified performance specifications without requiring the additional entry of any calibration factor or other correction data by the operator, including correction data entered by an instrument controller.

3.6.4 Local / Remote. The ANALYZER shall have a local and remote operation mode. It shall be either manually or remotely programmable selectable according to paragraph 3.6.2. Manual selection shall be provided by a front panel switch. A means of indicating the operational mode shall be provided. When changing modes, all parameter values shall remain unchanged.

3.6.5 Self-Test. The self-test shall comprise two selectable levels, an operation test to determine if the instrument is operationally ready, and second level diagnostic test to diagnose

and isolate faulty field replaceable modules. When the self-test function is initiated, an auto-sequenced internal operation test shall be performed. The diagnostic test shall be selectable only by deliberate operator command.

3.6.6 IEEE Interface. The ANALYZER shall have an IEEE-488.1 interface connector with the following capabilities: SH1, AH1, T6, L4, SR1, RL1, DT1. Serial poll capability shall be provided.

3.6.7 Compatibility. The ANALYZER shall be tested for compatibility with the IEEE-488 bus and the John Fluke model 1722A/AP instrument controller.

3.7 Manual. At least two copies of an operation and maintenance manual shall be provided. The manual shall meet the requirements of MIL-M-7298.

3.7.1 Calibration Procedure. The manual shall provide a ANALYZER calibration procedure in accordance with MIL-M-38793.

3.8 Accessories. The ANALYZER shall include the following:

3.8.1 One power cable in accordance with MIL-T-28800, with a minimum length of 6 feet.

3.8.2 One front panel handle kit.